



ELECTRICAL CURRENTS

Newsletter from the Office of the Chief Electrical Inspector

Ron Fuller, Chief Electrical Inspector

Vol. 8 No. 1

January 2005

● Code Update/RCW & WAC Courses - Spokane Classes Added

The department still has space and is offering the following free CEU classes:

4 hours Code Update, 4 hours RCW-WAC

20-Jan Kennewick, 1101 N Columbia Ctr. Blvd, Red Lion

15-Feb Spokane, E 1411 Mission, Avista Bldg. Auditorium

8 hours Code Update

8-Mar Moses Lake, 3000 W Marina Dr, Best Western Inn

9-Mar Spokane, E 1411 Mission, Avista Bldg. Auditorium

17-Mar Kennewick, 1101 N Columbia Ctr. Blvd, Red Lion

If you are interested in attending, you may apply via email to ElectricalProgram@lni.wa.gov

● Looking For Proven & Practical Ways To Prevent On-The-Job Injuries?

Try a series of documents called *Common Ground* for some fresh ideas. *Common Ground* emphasizes hazard identification and hazard elimination specific to electrical contractors. The examples given are from contractors and electricians doing business here in Washington State. Prevent injuries by trying some of these real-world practices.

Contractors are encouraged to try at least one or more new ideas from each edition:

- Work Site Hazard Analysis
- Working De-energized
- Lockout/Tagout
- Ladder Safety
- Housekeeping

Common Ground is mailed bi-weekly in November 2004 and in January/February 2005 to electrical contractors in the state. If you did not receive copies in the mail but would like to, please contact SHARP at our address below. Published by the Safety & Health Assessment & Research for Prevention (SHARP) Program at the Department of Labor and Industries, it is also available at:

www.lni.wa.gov/Safety/Research/HealthyWorkplaces/Electrical.

Do you have an injury prevention strategy you would like to share? The purpose of sharing successful strategies is to elevate the safety performance of the electrical industry as a whole. Big or small, strategies that work for you are worth sharing because they may work for others too. Please send your safety strategies to: SHARP Program, PO Box 44330, Olympia, WA 98504. You can phone toll free at 1-888-66-SHARP or send an E-mail to SHARP@lni.wa.gov.

● WAC 296-46B Timeline For Adoption

WAC 296-46B is now about half way through the adoption process. You should make the effort necessary to keep up to date on the proposed changes. All changes will affect you and the way you do business. Your failure to stay informed will likely cost you time and money. Don't let it happen to you.

January 27	Presentation to Electrical Board
April	Public Hearings
June 30	Effective date

The proposed WAC changes that will be presented to the Electrical Board are available for your use on the electrical program website:

www.Lni.wa.gov/TradesLicensing/electrical

● Wiring Methods In Medical, Dental Or Chiropractic Offices Or Clinics, Outpatient Or Ambulatory Surgical Clinics, And Other Such Health Care Occupancies

Although many of these health care facilities do not require plan review, portions of them are likely to require the special wiring methods of NEC Article 517. Patient care areas are defined NEC 517.2. All of the occupancies in this article (title) are likely to contain patient care areas in which the patient may come in contact with ordinary appliances or be connected to electro-medical devices.

NEC 517.13 requires an **insulated copper** conductor to ground receptacles and fixed equipment in patient care areas. This insulated grounding conductor and the branch-circuit conductors must be installed in a **metal** raceway or in types MI, MC, or AC cables. If such cables are used, the outer metal armor or sheath must be identified as an acceptable ground return path. For metal-clad cable (MC) or armored cable (AC) this identification is "Hospital Grade", "Suitable for Health Care Facilities", or similar language on the cable tag or reel. Most manufacturers also identify the cable armor with green or a green stripe. Flexible metal conduit does not meet this requirement for metal raceway. See NEC 517.13(A) and (B) for additional details on these and other branch-circuits for patient care areas.

● Preview – 2005 NEC Code Changes

The National Fire Protection Association is available. The 2005 Code does not become effective until it is formally adopted in the WAC rules. We have set a June 30, 2005 target date for adoption of this standard in Washington. If you do not stay up-to-date on code changes, the transition between codes can result in costly corrections. We encourage you to take your required code update class before June 30th.

One of the many changes is 2005 NEC 210.8(B)(4) requiring that all 125-volt 15- and 20-amp receptacles installed outdoors in areas accessible to the public are required to be GFCI protected. The Consumer Product Safety Commission provided substantial documentation citing incidents that individuals are being electrocuted by cord and plug equipment.

● Multiple Feeders To A Building Or Other Structure

Contractors are making multiple feeders to a single-family residence in violation of 2002 NEC 225.30. Typically only one feeder is allowed to serve a single-family residence. The only exceptions are permitted in 2002 NEC 225.30(A) through (D), when the feeder building disconnecting means is installed according to WAC 296-46B-225, or when the service disconnecting means is installed according to WAC 296-46B-230. The exceptions require that if the disconnecting means is installed outside the structure it must be: on the structure or within sight and within fifteen feet of the structure supplied. Multiple overcurrent protected feeders may then be installed into the structure.

● Voltage Drop Calculations

The wide range of answers generated from the "**Electrical Question Of The Month**" in the last issue of this newsletter shows the need to establish some uniformity in the calculation method used for voltage drop problems. Like fault current calculations, there are several methods that may be used to arrive at a theoretical "voltage drop". Parameters considered can include conversion of DC resistance to AC impedance, internal cable structure, operating temperatures, and raceway material. Many of these calculations must be done on the jobsite where circuit conductor lengths and sizes are established during the installation, we base exam questions on the following (simplified) method we believe is best adaptable to the field when used as described.

The $VD = (2 \times K \times I \times L) \div \text{wire circular mils}$ formula deals with only two (Al and Cu) conductor resistivity constants (K) in addition to one-way circuit length (L), load amps (I), and wire size expressed in circular mils (from NEC Chapter 9, Table 8). The constant (K-resistivity in ohms per circular mil-foot) is assumed to be **12.9** for copper wire and **21.2** for aluminum wire. We suggest you commit these values to memory. The K values are valid at 75°C (167°F) and constitute a conservative worst-case for the utilization of typical building wire. The alternate method using Ohm's Law and the DC resistance values in Table 8 also assumes the 75°C (167°F) operating temperature. Though K or DC resistance may be accurately adjusted for actual operating temperatures, and for the effects of AC self-induction, our basic electrical exam questions do not require this detail.

● Electrical Question of the Month

This Month's Question: In a 240 volt system the current draw on the feeder conductors is 110 amps. The one way length of the conductors feeding the load is 226 feet long and the wire size is stranded 1/0 aluminum USE. Does this installation comply with the minimum 3% voltage drop for feeders recommended by the NEC? **A)** Yes, **B)** No.

Last Month's Question: In a 120 Volt system the current draw on a circuit is 15 amps. The conductors feeding the load are 240 feet long one way and the wire size is stranded #10 copper THHN. What is the voltage being dropped on the conductor for the circuit? **A)** 8.9 Volts, **B)** 5.7 Volts, **C)** 14.7 Volts, **D)** 2.1 Volts. The answer is: **A)** 8.9 Volts.